Characterization of molecular features underlying drought tolerance in Mozambique´s drought tolerant maize (*Zea mays* L.) varieties

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Introduction

Maize (*Zea mays* L.) is the most important staple food in Mozambique but its production is facing constraints such as drought, floods, cyclones, soil infertility, diseases, and pests, being drought one of the most limiting factor. To meet the challenge of producing under such conditions, it is important to invest on breeding programs to produce maize varieties that are resistant and adaptable to the present agroecological conditions. Maize is a C4 plant that evolved a biochemical mechanism of concentrating CO_2 to overcome the oxygenase activity of Rubisco which makes C4 plants photosynthetically more efficient than C3 plants. We Hypothesized that the levels of enzymes involved in photosynthesis (PEPC, PPDK, NADP-ME, and RubisCO) and their Post Translational Modifications (PTMs) correlate with the photosynthetic capacity of maize plants under drought stress. To examine their potential role as molecular markers for drought tolerance, we will make use of cutting-edge proteomics techniques. We will also provide data on agronomic performance and nutritional quality of the maize grain grown under the Greenhouse conditions in ITQB and also under the local practices and agroecological conditions in Mozambique. We will use maize B73 as a control to test three varieties from Mozambique: Matuba, ZM523, and ZM 309. The main goal of the present project is to contribute with knowledge and important data that can be added to Mozambique's maize breeding programs.

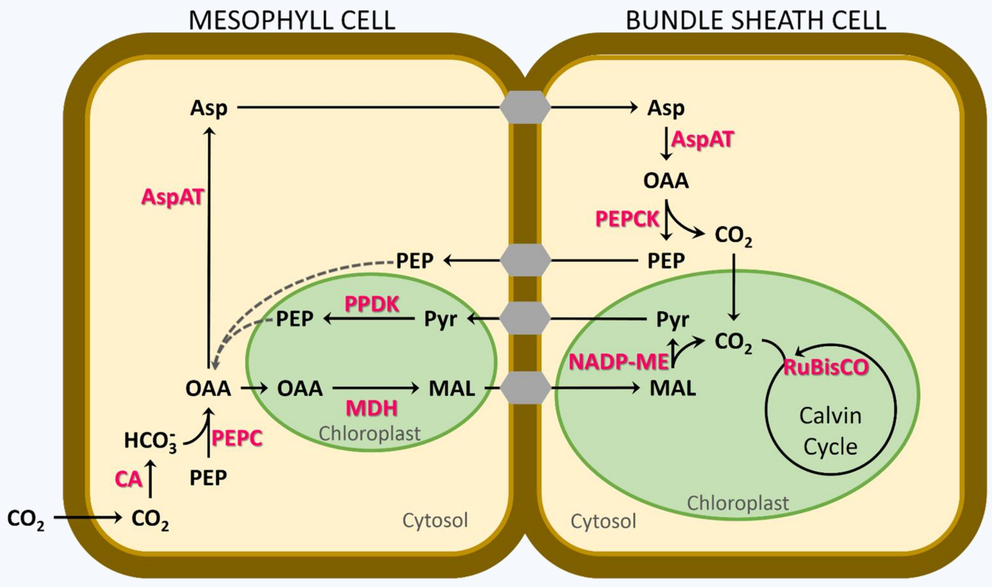

Fig. 1. Schematic representation of Hatch Slack Pathway describing the biochemical mechanism of concentrating CO_2 around Rubisco in Maize. This mechanism allows maize to very efficiently fix carbon and rapidly produce biomass.

Methodology

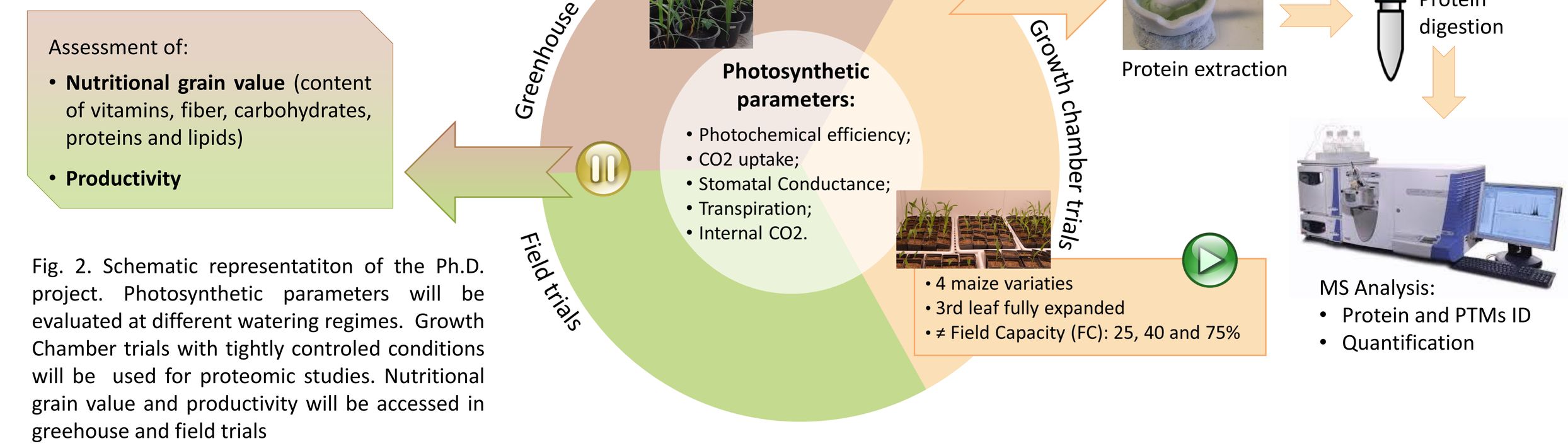

Fig. 2. Schematic representatiton of the Ph.D. project. Photosynthetic parameters will be evaluated at different watering regimes. Growth Chamber trials with tightly controled conditions will be used for proteomic studies. Nutritional grain value and productivity will be accessed in greehouse and field trials

Results on photosynthetic activity

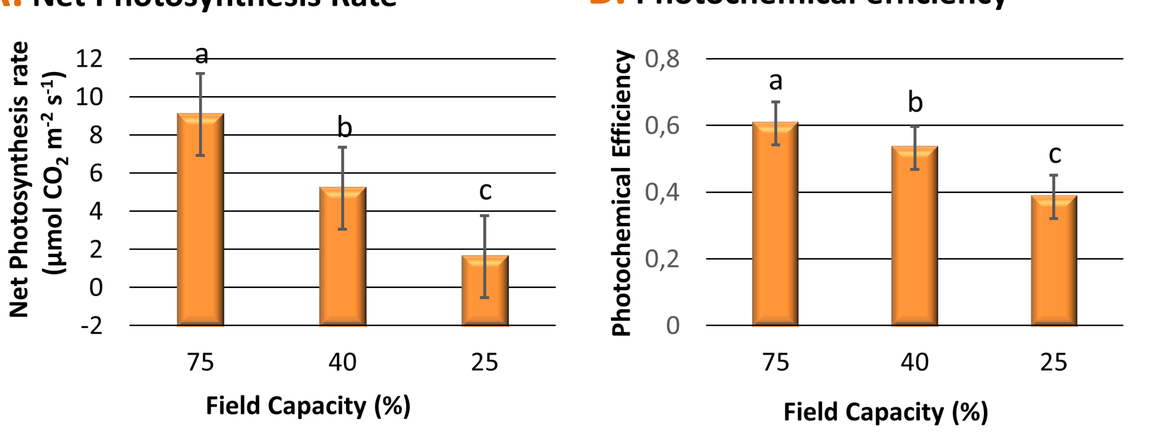

Fig. 3. Preliminary data on Net Photosynthesis Rate (A) and Photochemical efficiency (B) for all four varieties grown at 25% FC, 40% FC, and 75% FC in growth chamber conditions.

Conclusion and future perspectives

Preliminary data indicates that plants at 25%FC are photosynthetically less efficient. Following, we will conduct field experiments in Mozambique to evaluate the performance of Mozambique´s maize varieties under the local agroecological conditions and practices including intercropping with bean. Grain value (content of vitamins, fiber, carbohydrates, proteins and lipids) and productivity will be accessed.

Acknowledgments

Dizimalta Miquitaio acknowledges FCT for the fellowship SFRH/BD/128391/2017 and the Graduate Program Science for Development (PGCD). He also acknowledges GREEN-it (UID/Multi/04551/2013), PD/BD/113982/2015(IML) within PhD program MolBioS PD/00133/2012, SFRH/BPD/98619/2013(BMA), Ciência Program/FCT Investigator POPH(IAA).